

Multivariate Methods and Kinematic Calculations in DØ Higgs Analysis

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Abstract

This past summer spent interning at Fermilab has given me great experience and growth. First and foremost, I was actively involved in a research group doing Higgs analysis at the DØ Detector, one of the two particle detectors at the Tevatron. This opportunity gave me great experience. During the first several weeks of my internship, I spent much of my time learning about the general structure of Higgs analysis (applicable to all forms of particle physics analysis) and about the various techniques of doing such analysis, such as multivariate methods. During this time I also gradually began to learn and become comfortable with many various computer and software skills, which are very useful in particle physics or many other fields of science; these skills include ROOT analysis software, Linux operating systems, LaTeX text editor, and DØ's analysis framework. I also worked for several weeks on relativistic kinematic calculations of a Higgs event, focusing on the opening dijet angle of Higgs decay and its dependence on the event energy. From these calculations, I learned much about the nature of energy within particle collisions, which is what a majority of my research paper has been written about. For the last few weeks I have been looking at many possible Higgs event displays, cataloging over one hundred displays of the most likely Higgs events observed by the detector. Throughout the summer I attended many tours of Fermilab's facilities, giving me a hands-on view of physics at experiments such as g-2, MINOS, and the DØ detector itself. I learned much on the theoretical side of physics as well, often by going to lectures several times every week, gaining a deeper understanding of many subject on the research frontier, including introductory particle physics, neutrino physics, dark matter, cosmic acceleration, and, of course, the Higgs boson.